CLAIMS

What is claimed is:

1. A method comprising:

sensing respiratory information related to tidal volume;

based at least in part on the respiratory information, determining if tidal volume is less than a limit; and

if the tidal volume is less than the limit, calling for diaphragm activation at a stimulation power based on a nondecreasing monotonic relationship with respect to increasing tidal volume.

2. The method of claim 1 wherein the diaphragm activation includes a member selected from the group consisting of phrenic nerve stimulation and diaphragm stimulation.

3. The method of claim 1 further comprising delivering the diaphragm activation.

4. The method of claim 3 wherein the delivering the diaphragm activation occurs during inspiration caused in part by intrinsic activity.

5. The method of claim 3 further comprising monitoring respiratory information related to upper airway patency.

6. The method of claim 1 wherein the limit relies on historical respiratory information unaffected by Cheyne-Stokes respiration.

7. The method of claim 1 wherein the respiratory information includes information selected from the group consisting of impedance information, plethysmography information, IEGM information, neural activity information, pressure information, blood oxygen information, and blood carbon dioxide information.

8. The method of claim 1 wherein the calling for diaphragm activation intends to increase tidal volume.

9. The method of claim 8 wherein the calling for diaphragm activation intends to increase tidal volume to a tidal volume based at least in part on the historical respiratory information.

10. The method of claim 1 wherein if the tidal volume is less than another limit, then determining that the calling for diaphragm activation at a stimulation power based on a nondecreasing monotonic relationship with respect to increasing tidal volume will cause an upper airway collapse.

11. The method of claim 10 further comprising inhibiting the calling for diaphragm activation based on the determining that the calling for diaphragm activation at a stimulation power based on a nondecreasing monotonic relationship with respect to increasing tidal volume will cause an upper airway collapse.

12. A method comprising:

sensing respiratory information related to tidal volume;

determining if oscillations in tidal volume exist; and

upon sensing a decrescendo in tidal volume, calling for diaphragm activation at a stimulation power based on a nondecreasing monotonic relationship with respect to increasing tidal volume.

13. The method of claim 12 further comprising delivering the diaphragm activation at the stimulation power and determining whether an airway collapse occurred in response to the delivering.

14. The method of claim 12 wherein calling for diaphragm activation at the stimulation power aims to dampen oscillations in tidal volume.

15. A method comprising:

sensing respiratory information related to tidal volume;

determining if oscillations in tidal volume exist; and

upon sensing a crescendo in tidal volume, calling for diaphragm activation at a stimulation power based on a nondecreasing monotonic relationship with respect to increasing tidal volume.

16. The method of claim 15 further comprising delivering the diaphragm activation at the stimulation power and determining whether an airway collapse occurred in response to the delivering.

17. The method of claim 15 wherein calling for diaphragm activation at the stimulation power aims to dampen oscillations in tidal volume.

18. A method comprising:

sensing respiratory information related to tidal volume;

based at least in part on the respiratory information, determining if tidal volume is less than a limit and determining if the tidal volume indicates sufficient airway patency; and

if the tidal volume is less than the limit and if the tidal volume indicates sufficient airway patency, calling for diaphragm activation at a stimulation power based on a nondecreasing monotonic relationship with respect to increasing tidal volume.

19. An implantable apparatus comprising:

an input to receive information related to tidal volume; and

a microprocessor configured to use the information to determine if tidal volume is less than a limit and if the tidal volume is less than the limit to call for diaphragm activation at a stimulation power based on a

nondecreasing monotonic relationship with respect to increasing tidal volume.

20. The implantable apparatus of claim 19 wherein the input includes a connector to connect a lead to the apparatus.

21. The implantable apparatus of claim 19 wherein the information related to tidal volume comprises information selected from the group consisting of impedance information, plethysmograph information, IEGM information, neural activity information, pressure information, blood oxygen information, and blood carbon dioxide information.

22. The implantable apparatus of claim 19 wherein the limit relies on historical information related to tidal volume unaffected by Cheyne-Stokes respiration.

23. The implantable apparatus of claim 19 further comprising a pulse generator responsive to the call for diaphragm activation.

24. The implantable apparatus of claim 19 further comprising an output to deliver the stimulation power.

25. The implantable apparatus of claim 24 wherein the output includes a connector to connect a lead to the apparatus.

26. The implantable apparatus of claim 19 further comprising a pulse generator responsive to the call for diaphragm activation, a lead bearing one or more electrodes electrically connectable to the pulse generator and positionable proximate to a phrenic nerve.

27. The implantable apparatus of claim 19 further comprising a pulse generator responsive to the call for diaphragm activation, a lead bearing

one or more electrodes electrically connectable to the pulse generator and positionable proximate to a hemidiaphragm.

28. The implantable apparatus of claim 19 further comprising an input to receive information related to upper airway patency.

29. The implantable apparatus of claim 28 wherein the microprocessor is further configured to adjust the stimulation power based at least in part on the information related to upper airway patency.

30. The implantable apparatus of claim 19 further comprising an output to delivery cardiac stimulation.

31. A method comprising:

setting a delivery time to commence delivery of stimulation for diaphragm activation;

setting a stimulation power;

delivering the stimulation power commencing at the delivery time;

sensing respiratory information related to airway patency;

based on the respiratory information, determining if a collapse occurred in the airway; and

adjusting the delivery time in response to the determining.

32. A method comprising:

setting a delivery time to commence delivery of stimulation for diaphragm activation;

setting a stimulation power;

delivering the stimulation power commencing at the delivery time;

sensing respiratory information related to airway patency;

based on the respiratory information, determining if a collapse occurred in the airway; and

adjusting the stimulation power in response to the determining.

33. A method comprising:

sensing respiratory information related to tidal volume;

based at least in part on the respiratory information, determining if tidal volume is less than a limit; and

if the tidal volume is less than the limit, calling for diaphragm activation at a stimulation power based on the tidal volume.

34. An implantable apparatus comprising:

an output to deliver stimulation for diaphragm activation;

an input to receive information related to airway patency;

a microprocessor configured to use the information to determine if an airway collapse occurred in response to stimulation for diaphragm activation and to generate a relationship between a delivery time of the stimulation and a stimulation power.

35. A method comprising:

sensing respiratory information related to tidal volume;

based at least in part on the respiratory information, determining if tidal volume is between an upper limit and a lower limit; and

if the tidal volume is between the upper limit and the lower limit, calling for diaphragm activation at a stimulation power based on a nonincreasing monotonic relationship with respect to increasing tidal volume or, if the tidal volume is less than the lower limit, calling for diaphragm activation at a stimulation power based on a nondecreasing monotonic relationship with respect to increasing tidal volume.